CELLULAR RADIO TELECOMMUNICATIONS NETWORK

Cross-Reference To Related Application

This application claims priority of European Patent Application No. 00300503.0, which was filed on January 24, 2000.

Field of the Invention

This invention relates to cellular radio telecommunications networks.

Background of the Related Art

When communications between user equipment (UE) and a base station (Node B) deteriorate as the UE approaches a cell boundary, eventually, the radio network controller will decide that handover to another cell is necessary. In the presently proposed UMTS standard instructions are sent to the UE and the new Node B that transmissions should begin on the downlink and the uplink at a precise moment.

When adding a new radio link to a UE's active set, there is a risk that the transmission from the new Node B will be perceived by the UE as additional interference. This may be a problem for instance from the time where the new Node B has activated transmission until the UE has added the radio link to its active set. This is especially important when a UE uses a low spreading factor and consequently high power and/or when the UE is close to the new Node B.

This problem occurs, for instance, when a UE moves fast towards a new cell. If the UE has a rather bad connection to the current cell, the TCP commands in the current cell will be mainly ordering the current Node B to increase power on the down link. Eventually, the radio network controller decides that the UE shall have the new cell included in its active set. This decision may occur late if the UE is moving fast. When the new radio link is activated by (RL SETUP or RL ADDITION REQUEST) it is very likely that the new cell starts to receive the TCP commands ordering an increase in power. Until the UE receives the RRC message ACTIVE SET UPDATE ordering it to add the new Node B to its active set, it will see downlink transmissions from the new Node B as interference which may prevent receipt of the RRC message.

Summary of the Invention

Against this background there is provided, a cellular radio telecommunications network, in which communications between a mobile station in a first cell and a first base station are handed to a second base station as the mobile station enters a second cell under control of a radio network controller, wherein the second base station responds to information from the radio network controller to send downlink data to the mobile station only after it has received an uplink frame therefrom. This provides faster radio link set up, less interference and a smoother switch on of communications with the new Node B.

Preferably there is included means for detecting the power level of signals received from the mobile station, and wherein the second base station is controlled to send downlink data to the mobile station only when the uplink frame is received at a detected power level exceeding a power level set by the radio network controller.

The invention extends to a method of operation a cellular radio telecommunications network, in which communications between a mobile station in a first cell and a first base station are handed to a second base station as the mobile station enters a second cell under control of a radio network controller, comprising controlling the second base station, in response to information from the radio network controller, to send downlink data to the mobile station only after it has received an uplink frame therefrom.

The invention also extends to a computer program for carrying out the method.

Brief Description of the Drawings

One embodiment of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a schematic plan view of an urban environment in which are located three cells of a cellular radio telecommunications network embodying the invention; and

Figure 2 is a block diagram showing flow of data in the network of Figure 1.

Detailed Description

Referring to the drawings, roads 2 and 4 meet at a T-junction. The roads are bounded by high buildings which blank universal mobile telephone service (UMTS)

radio signals so that three cells 6,8 and 10, are required, served by base stations Node B-1, Node B-2 and Node B-3. A UE 12 travelling in the road 2 towards the junction is thus served by Node B-1. As it approaches the junction TPC commands within cell 8 will be mainly ordering increased downlink power to maintain the quality of service between the UE 12 and Node B-1. When the UE reaches the junction it will turn left or right (assuming it does not stop) and will require handing over to Node B-2 or Node B-3. In the arrangement shown, the UE will be closer to the new Node B-2 or Node B-3 than it is to Node B-1. If the UE is moving fast and TPC commands to increase downlink power reach, say Node B-3, before a radio link to the node is added to the active set of the UE, in the conventional proposal, downlink transmissions from Node B-3 to the UE will be seen by the UE as interference which may prevent receipt of the signalling information from Node B-1 to add a radio link to Node B-3 to its active set. if it is moving quickly. the UE will remain in radio contact with Node B-1 only briefly. So if the signalling information to add the radio link to Node B-3 to its active set, is transmitted after the UE has turned the corner, Node B-1 is blanked by the high buildings and the information cannot be received.

Referring to Figure 2, the radio network controller RNC 14 will predict that communications with the UE will need handover to Node B-2 or Node B-3 in good time. The RNC transmits an instruction to node, say, B-3 to activate a radio link to the UE. Node B-3 returns an acknowledgement. The RNC transmits instructions to the UE via Node B-1, to add a radio link to Node B-3 to its set of active radio links and will begin transmitting on the uplink immediately. To begin, the UE may be so far from the junction as to be blanked from Node B-3. When Node B-3 detects a correct frame of uplink transmissions from the UE, it begins transmitting on the downlink. Node B-3 is set to begin transmissions on the downlink only after detecting signals from the UE at a predetermined power level. In one alternative the power level is set by signalling information sent by the RNC.